

What Is Claimed Is:

1. A control method for a storage system comprising:

a first information processing device;

a second information processing device which is connected so as to be capable of communicating with the first information processing device, and which constitutes a cluster with the first information processing device;

a first storage device which is connected so as to be capable of communicating with the first information processing device, and performs writing/reading of data to a first storage area according to a data input/output request transmitted from the first information processing device; and

a second storage device which is connected so as to be capable of communicating with the second information processing device, and performs writing/reading of data to a second storage area according to a data input/output request transmitted from the second information processing device; wherein

the first storage device and the second storage device are connected so as to be capable of communicating with each other;

the second storage device, during a first processing in which the first storage device transmits to the second storage device a replication of the data written to the first storage area, and the second storage device that received the data writes the data to the second storage area, requests first information from the first storage device indicating that a replication of the data written in the first storage area has not yet been transmitted to the second storage device and that the replication of the data has not been written to the second storage area when notice of failover is received from the second information processing device;

the second storage device notifies the second information processing device that a data input/output request can be received when the first

information is received from the first storage device; and

the second storage device refers the first information upon receipt of a data read request transmitted from the second information processing device in which failover has occurred, requests the target data of the data read request from the first storage device when it is concluded that the target data of the data read request are stored in the first storage area, and transmits to the second information processing device the target data of the data read request transmitted from the first storage device as per the request.

2. The control method for a storage system according to claim 1, wherein the second storage device comprises a third storage area;

when a data write request is received from the second information processing device during execution of the first processing, the second storage device writes the target data of the data write request to the third storage area;

when the first processing is completed, the second storage device writes a replication of the data written in the third storage area to the second storage area; and

the second storage device transmits write data consisting of data written in the third storage area to the first storage device, and initiates a second processing consisting of processing whereby the first storage device that received the write data writes the write data to the first storage area.

3. The control method for a storage system according to claim 1, wherein the second storage device comprises a third storage area;

when the data write request is received from the second information processing device during execution of the first processing, the second storage device writes the target data of the data write request to the third storage area;

when the data read request is received from the second information

processing device, the second storage device determines whether or not the target data of the data read request are stored in the third storage area;

when it is concluded that the target data of the data read request are not stored in the third storage area, the second storage device refers the first information and determines whether or not the target data of the data read request are stored in the second storage area; and

when it is concluded that the target data of the data read request are not stored in the second storage area, the second storage device requests the target data of the data read request from the first storage device, and when the target data of the data read request transmitted from the first storage device as per the request are received, the second storage device transmits the target data of the data read request to the second information processing device.

4. The control method for a storage system according to claim 1, wherein

the second storage device comprises a third storage area;

when a data write request is received from the second information processing device during execution of the first processing, the second storage device writes the target data of the data write request to the third storage area;

when notice of failback is received from the first information processing device during execution of the first processing, the first storage device requests second information from the second storage device indicating that the data written in the third storage area has not yet been transmitted to the first storage device, and that the data has not been written to the first storage area;

when the second information is received from the second storage device, the first storage device notifies the first information processing device that a data input/output request can be received; and

the second storage device refers the second information when a data

read request transmitted from the first information processing device in which failback has occurred is received, requests the target data of the data read request from the second storage device when it is concluded that the target data of the data read request are stored in the third storage area, and transmits to the first information processing device the target data of the data read request transmitted from the second storage device as per the request.

5. The control method for a storage system according to claim 4, wherein the first storage device comprises a fourth storage area;

when a data write request is received from the first information processing device during execution of the first processing, the second storage device writes the target data of the data write request to the fourth storage area;

when the first processing is completed, the second storage device writes a replication of the data written in the third storage area to the second storage area;

the second storage device transmits write data consisting of data written in the third storage area to the first storage device, and initiates a second processing consisting of processing whereby the first storage device that received the write data writes the write data to the first storage area;

when the second processing is completed, the first storage device writes a replication of the data written in the fourth storage area to the first storage area; and

the first storage device transmits write data consisting of data written in the fourth storage area to the second storage device, and initiates a third processing consisting of processing whereby the second storage device that received the write data writes the write data to the second storage area.

6. The control method for a storage system according to claim 4, wherein

the first storage device comprises a fourth storage area;

when a data write request is received from the first information processing device during execution of the first processing, the first storage device writes the target data of the data write request to the fourth storage area;

when a data read request is received from the first information processing device, the first storage device determines whether or not the target data of the data read request are stored in the fourth storage area;

when it is concluded that the target data of the data read request are not stored in the fourth storage area, the first storage device refers the second information and determines whether or not the target data of the data read request are stored in the third storage area; and

when it is concluded that the target data of the data read request are stored in the third storage area, the first storage device requests the data from the second storage device, and when the target data of the data read request transmitted from the second storage device as per the request are received, the first storage device transmits the target data of the data read request to the first information processing device.

7. The control method for a storage system according to claim 1, wherein

the first information processing device monitors time at which the data write request is transmitted to the first storage device;

the first information processing device transmits the transmission time information together with the data write request to the first storage device;

the first storage device associates and administrates the target data of the data write request transmitted sequentially from the first information processing device with the transmission time information, respectively; and

the first storage device transmits the data stored in the first storage area to the second storage device in order from oldest to newest.

8. A storage system comprising:

a first information processing device;

a second information processing device which is connected so as to be capable of communicating with the first information processing device, and which constitutes a cluster with the first information processing device;

a first storage device which is connected so as to be capable of communicating with the first information processing device, and performs writing/reading of data to a first storage area according to a data input/output request transmitted from the first information processing device; and

a second storage device which is connected so as to be capable of communicating with the second information processing device, and performs writing/reading of data to a second storage area according to a data input/output request transmitted from the second information processing device; wherein

the first storage device and the second storage device are connected so as to be capable of communicating with each other;

the storage system comprises a replication processor for executing a first processing that consists of processing whereby the first storage device transmits to the second storage device a replication of the data written to the first storage area, and the second storage device that received the data writes the data to the second storage area;

the second storage device comprises a channel controller;

when notice of failover is received from the second information processing device during execution of the first processing, the channel controller requests first information from the first storage device indicating that the replication of the data written in the first storage area has not yet been transmitted to the second storage device, and that a replication of the data has not been written to the second storage area;

when the first information is received from the first storage device, the channel controller notifies the second information processing device that a data input/output request can be received; and

the channel controller refers the first information when a data read request transmitted from the second information processing device in which failover has occurred is received, requests the target data of the data read request from the first storage device when it is concluded that the target data of the data read request are stored in the first storage area, and transmits to the second information processing device the target data of the data read request transmitted from the first storage device as per the request.

9. The storage system according to claim 8, wherein

the second storage device comprises a third storage area and a disk controller;

the channel controller receives a data write request from the second information processing device during execution of the first processing;

the disk controller writes the target data of the data write request to the third storage area;

when the first processing is completed, the disk controller writes a replication of the data written in the third storage area to the second storage area; and

the replication processor transmits the data written by the second storage device in the third storage area to the first storage device, and initiates a second processing consisting of processing whereby the first storage device that received the data writes the data to the first storage area.

10. The storage system according to claim 8, wherein

the second storage device comprises a third storage area and a disk controller;

the channel controller receives a data write request from the second information processing device during execution of the first processing;

the disk controller writes the target data of the data write request to the third storage area;

the channel controller receives a data read request from the second information processing device;

the channel controller determines whether or not the target data of the data read request are stored in the third storage area;

when it is concluded that the target data of the data read request are not stored in the third storage area, the channel controller refers the first information and determines whether or not the target data of the data read request are stored in the second storage area; and

when it is concluded that the target data of the data read request are not stored in the second storage area, the channel controller requests the target data of the data read request from the first storage device, and transmits the target data of the data read request to the second information processing device upon receipt of the target data of the data read request transmitted from the first storage device as per the request.

11. The storage system according to claim 8, wherein

the second storage device comprises a third storage area and a disk controller;

the first storage device comprises a channel controller;

the channel controller of the second storage device receives a data write request from the second information processing device during execution of the first processing;

the disk controller writes the target data of the data write request to the third storage area;

when notice of failback is received from the first information processing device during execution of the first processing, the channel

controller of the first storage device requests second information from the second storage device indicating that the data written in the third storage area has not yet been transmitted to the first storage device, and that the data has not been written to the first storage area;

when the second information is received from the second storage device, the channel controller of the first storage device notifies the first information processing device that a data input/output request can be received; and

the channel controller of the first storage device refers the second information when a data read request transmitted from the first information processing device in which failback has occurred is received, requests the target data of the data read request from the second storage device when it is concluded that the target data of the data read request are stored in the third storage area, and transmits to the first information processing device the target data of the data read request transmitted from the second storage device as per the request.

12. The storage system according to claim 11, wherein

the first storage device comprises a fourth storage area and a disk controller;

the channel controller of the first storage device receives a data write request from the first information processing device during execution of the first processing;

the disk controller of the first storage device writes the target data of the data write request to the fourth storage area;

when the first processing is completed, the disk controller of the second storage device writes a replication of the data written in the third storage area to the second storage area;

the replication processor transmits the data written by the second storage device in the third storage area to the first storage device, and

initiates a second processing consisting of processing whereby the first storage device that received the data writes the data to the first storage area;

the disk controller of the first storage device writes the data received from the second storage device and written in the third storage area to the first storage area;

when the second processing is completed, the disk controller of the first storage device writes a replication of the data written in the fourth storage area to the first storage area; and

the replication processor transmits the data written by the first storage device in the fourth storage area to the second storage device, and initiates a third processing consisting of processing whereby the second storage device that received the data writes the data to the second storage area.

13. The storage system according to claim 11, wherein

the first storage device comprises a fourth storage area and a disk controller;

the channel controller of the first storage device receives a data write request from the first information processing device during execution of the first processing;

the disk controller of the first storage device writes the target data of the data write request to the fourth storage area;

the channel controller of the first storage device receives a data read request from the first information processing device;

the channel controller of the first storage device determines whether or not the target data of the data read request are stored in the fourth storage area;

when it is concluded that the target data of the data read request are not stored in the fourth storage area, the channel controller of the

first storage device refers the second information and determines whether or not the target data of the data read request are stored in the third storage area; and

when it is concluded that the target data of the data read request are stored in the second storage area, the channel controller of the first storage device requests the target data of the data read request from the second storage device, receives the target data of the data read request transmitted from the second storage device as per the request, and transmits the target data of the data read request to the first information processing device.

14. The storage system according to claim 8, wherein

the first information processing device comprises:

a timer for monitoring time at which the data write request is transmitted to the first storage device; and

a processor for transmitting the data write request to the first storage device and transmitting the transmission time information; and

the first storage device comprises:

the channel controller for associating and administrating the target data of the data write request transmitted sequentially from the first information processing device with the transmission time information, respectively; and

the channel controller for transmitting the data stored in the first storage area to the second storage device in order from oldest to newest.

15. A storage device for a storage system that comprises:

a first information processing device;

a second information processing device which is connected so as to be capable of communicating with the first information processing device, and which constitutes a cluster with the first information processing device;

another storage device which is connected so as to be capable of

communicating with the first information processing device, and performs writing/reading of data to a first storage area according to a data input/output request transmitted from the first information processing device; and

a storage device which is connected so as to be capable of communicating with the second information processing device, and performs writing/reading of data to a second storage area according to a data input/output request transmitted from the second information processing device; wherein

the other storage device and the storage device are connected so as to be capable of communicating with each other; and

the storage system comprises a replication processor for executing a first processing that consists of processing whereby the other storage device transmits to the storage device a replication of the data written to the first storage area, and the storage device that received the data writes the data to the second storage area; and wherein

the storage device comprises a channel controller;

when notice of failover is received from the second information processing device during executing of the first processing, the channel controller requests first information from the other storage device indicating that a replication of the data written in the first storage area has not yet been transmitted to the storage device, and that a replication of the data has not been written to the second storage area;

when the first information is received from the other storage device, the channel controller notifies the second information processing device that a data input/output request can be received; and

the channel controller refers the first information when a data read request transmitted from the second information processing device in which failover has occurred is received, requests the target data of the data read

request from the other storage device when it is concluded that the target data of the data read request are stored in the first storage area, and transmits to the second information processing device the target data of the data read request transmitted from the other storage device as per the request.

16. The storage device according to claim 15, comprising
a third storage area and a disk controller; wherein
the channel controller receives a data write request from the second information processing device during execution of the first processing;
the disk controller writes the target data of the data write request to the third storage area;
when the first processing is completed, the disk controller writes a replication of the data written in the third storage area to the second storage area; and
the channel controller transmits the data written in the third storage area to the other storage device.

17. The storage device according to claim 15, comprising:
a third storage area and a disk controller; wherein
the channel controller receives a data write request from the second information processing device during execution of the first processing;
the disk controller writes the target data of the data write request to the third storage area;
the channel controller receives a data read request from the second information processing device;
the channel controller determines whether or not the target data of the data read request are stored in the third storage area;
when it is concluded that the target data of the data read request are not stored in the third storage area, the channel controller refers the first information and determines whether or not the target data of the data

read request are stored in the second storage area; and

when it is concluded that the target data of the data read request are not stored in the second storage area, the channel controller requests the target data of the data read request from the other storage device, and transmits the target data of the data read request to the second information processing device upon receipt of the target data of the data read request transmitted from the other storage device as per the request.

18. A storage device for a storage system that comprises:

a first information processing device;

a second information processing device which is connected so as to be capable of communicating with the first information processing device, and which constitutes a cluster with the first information processing device;

a storage device which is connected so as to be capable of communicating with the first information processing device, and performs writing/reading of data to a first storage area according to a data input/output request transmitted from the first information processing device; and

another storage device which is connected so as to be capable of communicating with the second information processing device, and performs writing/reading of data to a second storage area according to a data input/output request transmitted from the second information processing device; wherein

the storage device and other storage device are connected so as to be capable of communicating with each other; and

the storage system comprises a replication processor for executing a first processing that consists of processing whereby the storage device transmits to the other storage device a replication of the data written to the first storage area, and the other storage device that received the data writes the data to the second storage area;

the other storage device comprises a third storage area; and

the other storage device receives a data write request from the second information processing device during execution of the first processing and writes the target data of the data write request to the third storage area; and wherein

the storage device comprises a channel controller;

when notice of failback is received from the first information processing device during execution of the first processing, the channel controller requests second information from the other storage device indicating that the data written in the third storage area has not yet been transmitted to the storage device, and that the data has not been written to the first storage area;

when the second information is received from the other storage device, the channel controller notifies the first information processing device that a data input/output request can be received; and

the channel controller refers the second information when a data read request transmitted from the first information processing device in which failback has occurred is received, requests the target data of the data read request from the other storage device when it is concluded that the target data of the data read request are stored in the third storage area, and transmits to the first information processing device the target data of the data read request transmitted from the second information processing device as per the request.

19. The storage system according to claim 18, wherein

the storage device comprises a fourth storage area and a disk controller;

the channel controller receives a data write request from the first information processing device during execution of the first processing;

the disk controller writes the target data of the data write request

to the fourth storage area;

the channel controller receives the data written in the third storage area transmitted from the other storage device;

the disk controller writes the data written in the third storage area to the first storage area;

when all the data written in the third storage area are written, the disk controller writes a replication of the data written in the fourth storage area to the first storage area; and

the channel controller transmits the data written in the fourth storage area to the other storage device.

20. The storage system according to claim 18, wherein

the storage device comprises a fourth storage area and a disk controller;

the channel controller receives a data write request from the first information processing device during execution of the first processing;

the disk controller writes the target data of the data write request to the fourth storage area;

the channel controller receives a data read request from the first information processing device;

the channel controller determines whether or not the target data of the data read request are stored in the fourth storage area;

when it is concluded that the target data of the data read request are not stored in the fourth storage area, the channel controller refers the second information and determines whether or not the target data of the data read request are stored in the third storage area; and

when it is concluded that the target data of the data read request are stored in the second storage area, the channel controller requests the target data of the data read request from the other storage device, receives the target data of the data read request transmitted from the other storage

device as per the request, and transmits the target data of the data read request to the first information processing device.